

PATENT ABSTRACTS OF JAPAN

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(21)Application number : 07-202286 (71)Applicant : MITSUI TOATSU

(22)Date of filing : 08.08.1995 (72)Inventor : TATSUHIRO KURASAWA
TAKAO TANAKA
AKIO YOSIKAWA

CLAIMS

[Claim(s)]

[Claim 1] The electrode active material of the nonaqueous battery using lithium-nickel multiple oxide ($Li_xNi_yN_zO_2$, N is elements except Li, Ni and O, $0.8 < x < 1.2$, $0.8 < y+z < 1.2$, and $0 <= z < 0.2$) coated with lithium-transition-metals M multiple oxide (M is at least one sort of Co, Mn, and Fe, and including a small amount of Ni).

[Claim 2] The manufacturing method;

1. The compound of transition-metals M (M is one or more sorts of Co, Mn, and Fe, and including a small amount of Ni) and lithium compound are dissolved or suspended in a solvent.
2. Lithium-nickel multiple oxide expressed by the general formula $Li_xNi_yN_zO_2$ (N is other than Li, Ni, O, $0.8 < x < 1.2$, $0.8 < y+z < 1.2$, and $0 <= z < 0.2$) is added into above solvent.
3. The slurry is dried and calcinated.

[Claim 3] The nonaqueous electrolyte battery using the electrode active material according to claim 1 for the positive electrode or the negative electrode.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[The propose of this Invention]

To improve the cycleability of a battery.

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[Example 1]

1. Lithium hydroxide monohydrates 83.9g + Nickel hydroxide 185.4g
(atomic-ratio Li/Ni(mole ratio) =1.0)
2. Mill and mix it with ball mill.
3. Dry at 150 degree C for 12 h.
4. The mixture was calcinated at 750 degree C for 5 h in oxygen ambient atmosphere.
5. Mill it for 1 h with ball mill in nitrogen ambient atmosphere.
The average particle size of lithium nickel multiple oxide is 7 um.
6. Ethanol 300g + Lithium nitrate 3.4g + Cobalt nitrate hexahydrate 14.6g
(atomic-ratio Li/Co(mole ratio) =1.0)
7. The mixture + Lithium nickel multiple oxide 92.7g
(atomic-ratio Co/Ni(mole ratio) =0.05)
8. Dry the dispersion with Spray dryer which the temperature of the spray exit is 100 degree C.
9. Calcinate it at 700 degree C for 1 h in oxygen ambient atmosphere.

[Example 2]

1. Lithium nitrate 137.9g + Nickel hydroxide 185.4g
(atomic-ratio Li/Ni(mole ratio) =1.0)
2. Mill and mix it with ball mill.
3. Dry at 150 degree C for 12 h.
4. The mixture was calcinated at 700degree C for 10 in oxygen ambient atmosphere.
5. Mill it for 1 h with ball mill in nitrogen ambient atmosphere.
The average particle size of lithium nickel multiple oxide is 12 um.
6. Ethanol 300g + Lithium hydroxide monohydrate 2.1g + Cobalt nitrate hexahydrate 14.6g
(atomic-ratio Li/Co(mole ratio) =1.0)
7. The mixture + Lithium nickel multiple oxide 92.7g
(atomic-ratio Co/Ni(mole ratio) =0.05)

8. Dry the dispersion with Spray dryer which the temperature of the spray exit is 100 degree C.
9. Calcinate it at 700 degree C for 1 h in oxygen ambient atmosphere.

[Example 3]

1. Lithium hydroxide monohydrate 83.9g + Nickel hydroxide 166.9g + Aluminum hydroxide 15.6g
(atomic-ratio Li/Ni/Al(mole ratio) =1.0/0.9/0.1)
2. Mill and mix it with ball mill.
3. Dry at 150 degree C for 12 h.
4. The mixture was calcinated at 750 degree C for 5 h in oxygen ambient atmosphere.
5. Mill it for 1 h with ball mill in nitrogen ambient atmosphere.
6. Ethanol 300g + Lithium hydroxide monohydrate 2.1g + Cobalt nitrate hexahydrate 14.6g
(atomic-ratio Li/Co(mole ratio) =1.0)
7. The mixture + Lithium nickel multiple oxide 92.7g
(atomic-ratio Co/Ni(mole ratio) =0.05)
8. Dry the dispersion with Spray dryer which the temperature of the spray exit is 100 degree C.
9. Calcinate it at 700 degree C for 1 h in oxygen ambient atmosphere.

[Example 4]

1. Lithium hydroxide monohydrate 83.9g + Nickel hydroxide 166.9g + Cobalt carbonate 137.0g
(atomic-ratio Li/Ni/Co(mole ratio) =1.0/0.9/0.1)
2. Mill and mix it with ball mill.
3. Dry at 150 degree C for 12 h.
4. The mixture was calcinated at 750 degree C for 5 h in oxygen ambient atmosphere.
5. Mill it for 1 h with ball mill in nitrogen ambient atmosphere.

6. Ethanol 300g + Lithium hydroxide monohydrate 2.1g + Cobalt nitrate hexahydrate 14.6g
(atomic ratio Li/Co(mole ratio) =1.0)
7. The mixture + Lithium nickel multiple oxide 92.7g
(atomic ratio Co/Ni(mole ratio) =0.05)
8. Dry the dispersion with Spray dryer which the temperature of the spray exit is 100 degree C.
9. Calcinate it at 700 degree C for 1 h in oxygen ambient atmosphere.

[Example 5]

1. Lithium hydroxide monohydrates 83.9g + Nickel hydroxide 185.4g
(atomic ratio Li/Ni(mole ratio) =1.0)
2. Mill and mix it with ball mill.
3. Dry at 150 degree C for 12 h.
4. The mixture was calcinated at 750 degree C for 5 h in oxygen ambient atmosphere.
5. Mill it for 1 h with ball mill in nitrogen ambient atmosphere.
6. Ethanol 300g + Lithium nitrate 3.4g + Cobalt nitrate hexahydrate 14.6g
(atomic ratio Li/Co(mole ratio) =1.0)
7. The mixture + Lithium nickel multiple oxide 92.7g
(atomic ratio Co/Ni(mole ratio) =0.05)
8. Dry the dispersion with Spray dryer which the temperature of the spray exit is 100 degree C.
9. Calcinate it at 700 degree C for 1 h in oxygen ambient atmosphere.

[Table 1]

Initial capacity

Capacity at 50 cycles

	初期放電容量 (mA h/g)	充放電 50サイクル後の 放電容量 (mA h/g)
実施例1	168	152
実施例2	171	152
実施例3	160	149
実施例4	158	150
実施例5	155	142
比較例1	142	121
比較例2	138	121
比較例3	115	106
比較例4	133	117

The examples of comparison
Non-coated sample